

## Thiele - Small Parameter Consistency Check

MJ King  
7/03/09

### Constant Definitions

$$\text{cycle} := 2 \cdot \pi \cdot \text{rad}$$

$$\text{Hz} := \text{cycle} \cdot \text{sec}^{-1}$$

$$c := 344 \cdot \text{m} \cdot \text{sec}^{-1}$$

$$\rho := 1.205 \cdot \text{kg} \cdot \text{m}^{-3}$$

### User Input Data

#### Known Driver Thiele / Small Parameters

$$f_d := 51.5 \cdot \text{Hz}$$

$$Q_{md} := 5.391$$

$$R_e := 7.06 \cdot \text{ohm}$$

$$Q_{ed} := 0.5518$$

$$S_d := 324 \cdot \text{cm}^2$$

$$Bl := 6.416 \cdot \frac{\text{newton}}{\text{amp}} \quad (1 \text{ newton/amp} = 1 \text{ Tesla-m})$$

### Calculated Parameters

#### Derived Thiele / Small Parameters

$$Q_{td} := \left( \frac{1}{Q_{ed}} + \frac{1}{Q_{md}} \right)^{-1} \quad Q_{td} = 0.501$$

$$M_{md} := \frac{Bl^2 \cdot Q_{ed}}{f_d \cdot R_e} \quad M_{md} = 9.943 \text{ gm}$$

$$C_{md} := \left( M_{md} \cdot f_d^2 \right)^{-1} \quad C_{md} = 9.605 \times 10^{-4} \frac{\text{s}^2}{\text{kg}}$$

$$V_{ad} := C_{md} \cdot \left( \rho \cdot c^2 \cdot S_d^2 \right) \quad V_{ad} = 143.781 \text{ liter}$$

$$\eta_o := V_{ad} \cdot \left( 2 \cdot \pi \cdot c^3 \cdot Q_{ed} \cdot f_d^{-3} \right)^{-1} \quad \eta_o = 3.452 \%$$

$$\text{SPL} := 112 + 10 \cdot \log(\eta_o) \quad \text{SPL} = 97.4 \text{ dB}$$